

Evaluation of Garden State Parkway Widening in  
Essex County for HOV Treatment

The New Jersey Highway Authority plans to add a fourth lane to the Garden State Parkway between Interchange 143A and 145 (northbound) and between 145 and 143 (southbound). This "widening" will, in effect, make use of the existing right-of-way in this section of the Parkway. The median shoulder will be maintained at a width of 2½ to 3 feet and a 42" concrete center barrier will replace the existing timber median divider. The shoulder on the right will be reduced to a 10 foot width and in many cases, to a width less than that to accommodate four traveled lanes. This "widening" will leave a 1½ mile section of three-lane Parkway (in each direction) south to the Union Plaza. South of the Union Plaza the current construction project will provide for four lanes of traffic in each direction to the intersection with the New Jersey Turnpike (a distance of approximately 14 miles).

This analysis was conducted primarily to determine the suitability of giving priority treatment to carpools in the form of a HOV lane in the left lane for the morning and evening peak periods. The analysis that follows is provided under the following headings:

1. Traffic Characteristics
2. Geometric Characteristics
3. Enforcement
4. Accident Potential
5. Coordination with HOV Lane - South of the Union Plaza.





## 1. Traffic Characteristics

Figure 1 delineates 1978 and 1983 AADT and peak hour volumes, the number of eligible carpoolers (at 3+ persons per car), the estimate of the level-of-service of roadway conditions (both with and without a HOV lane), and the 1978 and 1983 cross-section conditions. In addition, the condition of the roadway is delineated south of the planned widening if a HOV lane were continued to the Union Toll Plaza. It can be seen that the northbound evening period has the highest percentage of eligible carpoolers. The eligible carpool vehicles are simply an estimate of the number of vehicles in any section that has three or more persons per vehicle. It does not reflect the origin and destination characteristics of the traffic. If this were taken into account, the proximity of access and egress ramps would reduce the overall number of actual HOV lane users because of either the inability or unwillingness to make use of the left-hand lane for one or two exits.

Table 1 (attached) gives estimates of the travel time savings to the carpool traffic by section of road and time of day for the planned widening. It can be seen from Table 1 that the only significant benefit would be to the northbound evening traffic and then limited to less than one minute per vehicle for a few time periods on two sections of the road. This comparison of travel time differences is made on the basis of 1978 traffic volumes. If 1983 volumes were used, there would be no projected increase in non-priority traffic (on the basis of New Jersey Highway Authority estimates),

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hence no speed change in the non-priority lanes, and no travel time difference between the non-priority traffic and priority traffic from the Table 1 estimates. The travel time savings will result in just over 40 person hours a day in reduced delay to HOV users. However, the rate of vehicle breakdowns would have a greater effect on the non-priority traffic that would give the HOV traffic that much more of a benefit.

## 2. Geometric Characteristics

The Highway Authority plans to provide four 11-foot travel lanes over this section of the Parkway, a 3-foot left shoulder and a 10-foot right shoulder (for as much of the distance as possible). However, one-quarter of the distance (1/2-mile length) will have lanes of only 10-foot width and almost one-half of the distance (one mile in length) will have a right shoulder of less than 10 foot width.

The suggested method of starting a HOV lane in each direction would cause a redesign of the current widening plans. In the northbound direction, plans call for the access ramp of 143A to be realigned and effectively made the right lane of the roadway. If the left lane is to be safely used as a HOV lane and if it is to be started at this point, the through lanes must be striped so that the right lane south of the entry ramp at 143A must move to the right and the entry ramp traffic will be forced to make use of a shortened acceleration lane. In the southbound direction, a similar restriping would be necessary, however, at this point, the high volume (2,000 vehicles per hour) entry





ramp from I-280 which will be forced to use a shortened acceleration lane, could cause considerable backup onto the ramp. In effect, the Parkway would be restriped at both of these locations so that the left lane would have to be entered from the right to effect a safe operation. The only other design that would be possible would be to force traffic to leave the left lane by the use of regulatory signs. However, this design would have a much greater potential for a high accident occurrence brought on by the forced merge of several thousand vehicles within an hour and would further complicate the difficult enforcement effort.

Throughout most of the 2 - 2½ mile length of the proposed "widening," traffic conditions with a HOV lane will be no worse than they are today without a HOV lane. The exception to this, both in the northbound and southbound roadways, is between the 143B and 144 ramps northbound and 144 and 143 ramps southbound. Each of these sections (NB-7 and SB-7, Figure 1) currently has three lanes of through traffic with an auxiliary lane to handle the weaving access and egress traffic. If the roadway is "widened" to four through lanes and the left lane is reserved for HOV traffic, the right lane will then become the lane that must be used for the weaving traffic since the auxiliary lane will have been removed. This will have a reducing effect on the capacity of the sections. This can be noted in Figure 1 as the difference between the levels of service of 1978 volumes and 1983 volumes with the HOV lane. Today, these sections are considered to be limiting sections to the





smooth flow of traffic on the Parkway. With the widening and the addition of a HOV lane and the deletion of the auxiliary lane, these sections will be even more limiting to the smooth flow of traffic.

### 3. Enforcement

The successful operation of a HOV lane is contingent on maintaining a relatively low violation rate (number of less than three person vehicles in the lane). It is to be expected that many drivers will wish to take advantage of a relatively smoothly flowing lane (the HOV lane) when conditions start to get congested in the normal flow. The greater the congestion, the higher the violation rate can be expected to be. It is generally accepted that frequent and visible police enforcement is essential to reduce violations, or at least keep them to a minimum. Within the section of the Parkway that is considered for widening there will be no median shoulder within which police vehicles may station themselves, hence, visibility along the lane will be absent. The only possibility will be the stationing of police vehicles along those sections of the road on the right side where 10-foot shoulders exist. The obvious disadvantages to this method of operation are:

1. The occupancy of vehicles within the HOV lane is not easily detected by the police from this point of the road.
2. The police must weave across three congested lanes of traffic when a violator is detected.





3. The police must escort the violator back to the right side of the road across three congested lanes of traffic to an area where a ten-foot shoulder exists to issue a summons.

The narrow median also effectively precludes the ability to turn around within the median section thereby forcing the police to use the local street system for all of these required maneuvers and thus reducing their effectiveness.

#### 4. Accident Potential

The combination of narrow lanes, lack of median shoulder, large speed differentials between HOV lane and others, and high rate of flow combines to produce the specter of a potentially dangerous safety situation, especially during those times of left lane vehicle breakdown and police apprehension of violators in the left lane. The primary problem would appear to be the absence of a median shoulder with four lanes of through traffic. Secondarily, lateral movement becomes very restricted with the reduction in lane width from twelve feet to ten feet. This reduction in lane width also affects the overall weaving and merging maneuvers on the roadway. However, it is anticipated that the combination of a 45 mph posted speed limit and the narrow lanes will reduce the overall speed of traffic on the road, hence, mitigating what would otherwise be a more serious safety consideration.





5. Coordination with HOV Lane - South of the Union Plaza

The current widening project of the Parkway on the state-owned section between Raritan and Union Plazas will provide four lanes of traffic over most of the distance. With the completion of construction, the median lane in each direction will be reserved as a HOV lane during the morning and evening peak periods. These lanes will be in effect to approximately one mile south of the Union Plaza. If the Essex widening plans were continued south from the current terminus to the Union Plaza, consideration could be given to a continuous operation of approximately 15 miles for a median HOV lane. But this is not possible unless the 1½ mile section of the Parkway from Union Plaza north is also "widened."

The continuous operation of a lane from south of Union Plaza, where enforcement is not a problem because of the existence of a median shoulder, might tend to ease the enforcement problems that exist in the northern section. This is based on the rationale that the users of the Parkway would become used to both continuous operation and enforcement of the lane over a long section and, hence, may tend to respect the priority nature of traffic that is intended for its use. In addition, the continuous operation would allow for an integrated treatment of carpoolers with priority lane and potential toll reduction at the Plaza. The toll reduction for carpoolers is possible in either case, but with a continuous operation, the left lanes at the Plaza can give priority treatment to carpoolers without a weaving of vehicles on the approaches.





Table 2 indicates that nearly 50 percent of the traffic that proceeds northbound through the Union Plaza, continues north past Exit 145. This, in effect, indicates that approximately one-half of the users of a priority lane south of the Plaza would continue as through traffic through the section in question.

An analysis of distances required to move from the right lane to the HOV lane and back indicates the following miles required during the peak hours:

	Northbound		Southbound	
	AM	PM	AM	PM
Right Lane to HOV Lane	0.6	0.6	0.8	0.8
HOV Lane to Right Lane	0.7	0.8	1.0	1.0
Combined	1.3	1.4	1.8	1.8

As shown above the distance a HOV must travel to get to the lane and back to the right ranges from 1.3 to 1.8 miles. This distance would reduce the benefit to vehicles entering the road north of Interchange 142A and those HOV vehicles exiting within the widened section. Internally accessing HOVs, exiting at Interchange 145 in the afternoon peak hour, would have to exit after travelling less than 2/3 the length of the lane. The same distance applies to the southbound morning peak hour, resulting in only 2/3 of the lane being available to this major ramp's traffic. Volume projections for 1983 show this northern third of the widened roadway to be operating at level of service F, thus providing difficult conditions in the non-priority lanes.





# GARDEN STATE PARKWAY IMPACT OF ESSEX WIDENING

## UNION TOLL PLAZA TO EAST ORANGE TOLL RAMP (I-280)

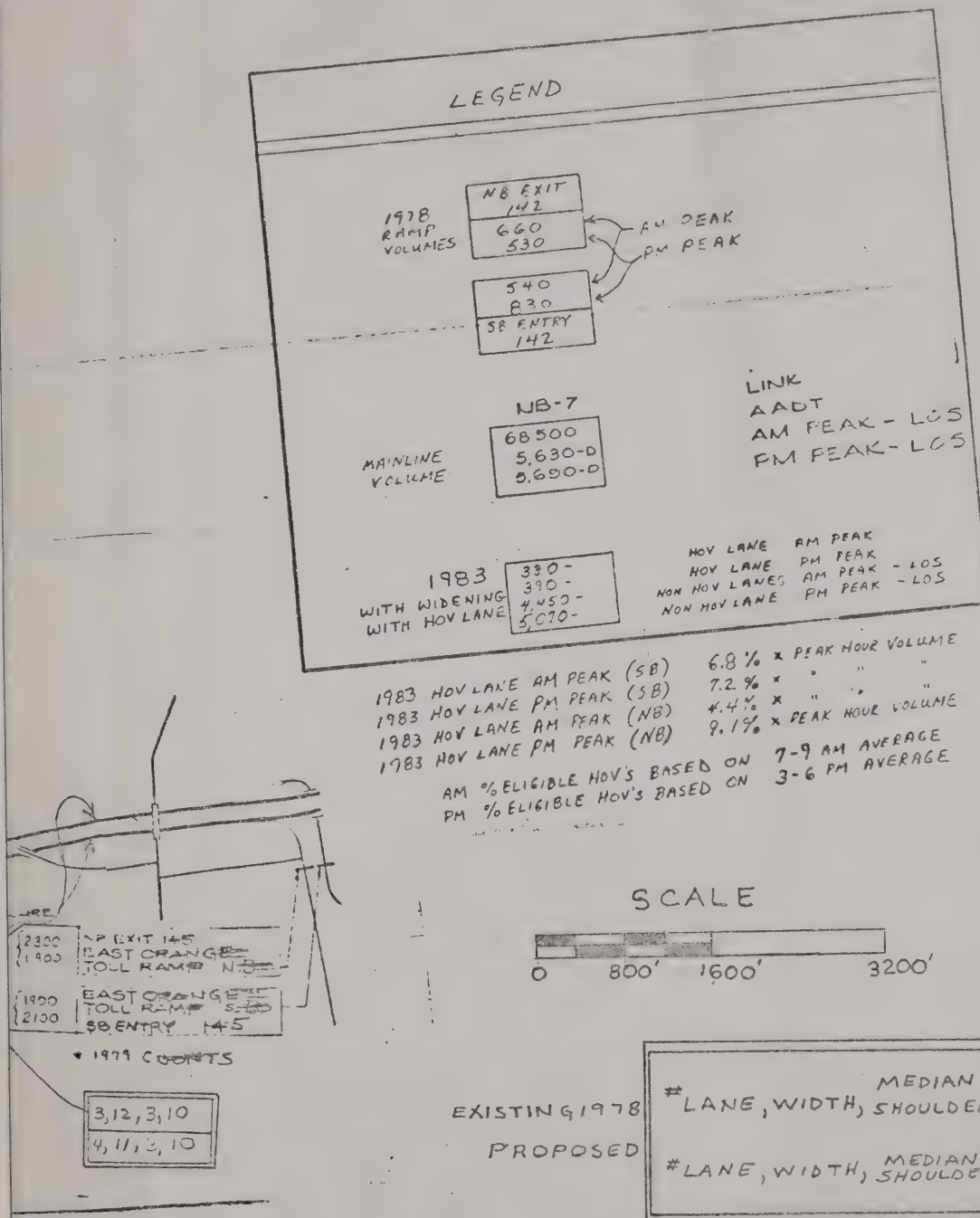


FIGURE #1



NOT UNDER CONSIDERATION FOR WIDENING  
HOWEVER, DATA BASED ON WIDENED CONDITION

GARDEN STATE PARKWAY  
IMPACT OF ESSEX WIDENING

UNION TOLL PLAZA TO EAST ORANGE  
TOLL RAMP (I-280)

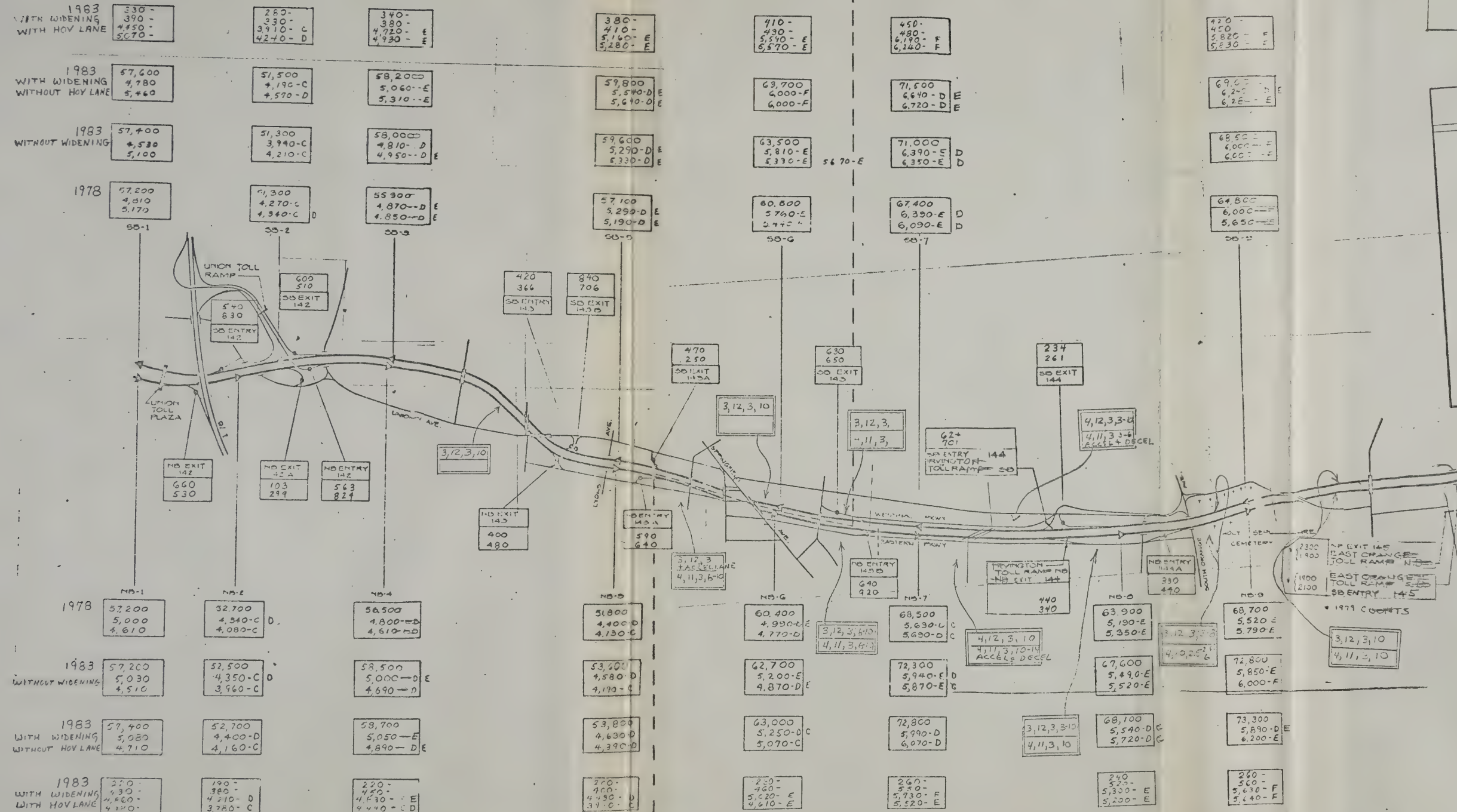


FIGURE #1





TABLE 1

TRAVEL TIME SAVINGS FOR  
HOV VEHICLES - UNION-ESSEX WIDENING

Assuming 45 mph speed limit:

Southbound: 7-9 a.m.

Peak Hour = 6075 (R&D, 1979)  
Peak Hour = 6390 (Vollmer, 1978)  
No Savings !!

Southbound: 3-6 p.m.

Peak hour = 5310 (R&D, 1979)  
Peak Hour = 6090 (Vollmer, 1978)  
4:00-4:15 p.m., 2 seconds saved

Total Vehicle-Hours Saved  $\approx$  .07  
Total Passenger-Hours Saved  $\approx$  .23

Northbound: 7-9 a.m.

Peak Hour = 5740 (R&D, 1979)  
Peak Hour = 5630 (Vollmer, 1978)

	7:00	7:15	7:30	7:45	8:00	8:15
143A Ent.						
143B Ent.						
144 Exit	1	3	3			3
144A Ent.						
145 Exit		4	10	15		
TOTAL (sec.)	1	7	13	15		3

Total Vehicle-Hours Saved  $\approx$  0.6  
Total Passenger-Hours Saved  $\approx$  2.5





TABLE 1 (CONTINUED)

Northbound: 3-6 p.m.

Peak Hour = 5980 (P&D, 1979)

Peak Hour = 5690 (Vollmer, 1978)

	3:45	4:00	4:15	4:30	4:45	5:00	5:15	5:30	5:45	6:00
143A Ent.										
143B Ent.					30	24	19	62	30	
144 Exit	1		7	7	14	12	31	34	12	
144A Ent.						5	2	3	1	
145 Exit			1	3	4	5				
TOTAL (sec.)	1		8	10	48	46	52	99	43	

Total Vehicle-Hours Saved = 10.8

Total Passenger-Hours Saved = 38.7

TABLE 2

DESTINATIONS OF UNION TOLL PLAZA  
VEHICLES BY PERCENT

	NORTHBOUND		7-9 a.m.		3-6 p.m.	
	EXITS 142	EXIT 143	EXIT 144	EXIT 145	NORTH OF EXIT 145	
A.M.	7.5	6.7	9.9	31.0	44.9	
P.M.	5.3	10.3	5.3	25.8	53.3	

Source: New Jersey Highway Authority O&D Survey Data-  
1976



Review of Garden State Parkway  
in Essex County for HOV Treatment

8/16/79

2-5700

Four basic sources of information were used in our evaluation of the referenced project.

- A. Richard A. Alaimo Engineering Associates report "Project Description - Garden State Parkway, Essex Widening,"
- B. The Vollmer Associates, Inc. report on the "Evaluation of the Essex Widening Project,"
- C. Fifty scale plans of the proposed widening (reviewed in the office of the New Jersey Highway Authority), and
- D. Travel time, occupancy and limited volume counts taken on the Parkway during the week of August 6.

The net effect of our investigation leads to the conclusion that an HOV lane within the confines of the widened section (as planned by the New Jersey Highway Authority), would not be appropriate. There are three primary reasons supporting this conclusion.

1. Enforcement of the lane would be extremely difficult, if not impossible, due to the complete absence of a shoulder on the left side of the roadway (alongside a proposed HOV lane). In addition, almost half of the entire 2 to 2½ mile widened section would have less than a 10 foot shoulder on the right side of the roadway. Without the availability of shoulders, police would not only be unable to station their vehicles but would also find it difficult to remove and summons violating drivers in the priority lane.
2. There are numerous geometric shortcomings, in addition to the lack of shoulder, that cause traffic flow problems. The institution of an HOV lane would only exacerbate some of these problems and result in an overall disbenefit.
3. The limited length of the lane and the high density of traffic would not effectively allow intermediate accessing traffic to make extensive use of the lane. This, in effect, would have a





August 16, 1979

severe limitation on the number of drivers who would take advantage of the lane.

The aforementioned shortcomings could be overcome to some extent, if the HOV lane could be made continuous from the state-owned section one mile south of the existing Union Toll Plaza. Although enforcement problems would still exist in the northern limits of the Essex widening, the existence of enforcement further south may mitigate the lack of it in the northern section. In addition, the savings benefits afforded to the users of the priority lane could be made more substantial because of the greater distance of the lane and special treatment at the Union Toll Plaza. With the current discontinuous potential lane, users of an HOV lane south of Union Plaza would have a 2 to 2½ mile gap with the existence of an HOV lane in the Essex section.

Attached you will find a more detailed discussion of the points raised in this cover memorandum.

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Eugene F. Reilly  
Director of Research

EFR:ls

Att.

cc: Mr. R. Hollinger





R/c

TO Mr. Lawrence Schmidt

## MEMORANDUM

FROM Melvin R. Lehr

Office of Environmental Review

SUBJECT Review of Garden State Parkway in DATE 8-20-79 TELEPHONE NO. 2-3160  
Essex County for HOV Treatment

Enclosed is a copy of a report prepared by my Research section concerning an Evaluation of the Garden State Parkway Widening in Essex County for HOV Treatment. The conclusions we reach are that an HOV lane within the confines of the widened section (as planned by the New Jersey Highway Authority) would not be appropriate. There are three primary reasons supporting this conclusion.

1. Enforcement of the lane would be extremely difficult, if not impossible, due to the complete absence of a shoulder on the left side of the roadway (alongside a proposed HOV lane). In addition, almost half of the entire 2 to 2 1/2 mile widened section would have less than a 10 foot shoulder on the right side of the roadway. Without the availability of shoulders, police would not only be unable to station their vehicles but would also find it difficult to remove and summons violating drivers in the priority lane.
2. There are numerous geometric shortcomings, in addition to the lack of shoulder, that cause traffic flow problems. The institution of an HOV lane would only exacerbate some of these problems and result in an overall disbenefit.
3. The limited length of the lane and the high density of traffic would not effectively allow intermediate accessing traffic to make extensive use of the lane. This, in effect, would have a severe limitation on the number of drivers who would take advantage of the lane.

The aforementioned shortcomings could be overcome to some extent, if the HOV lane could be made continuous from the state-owned section one mile south of the existing Union Toll Plaza. However, enforcement problems would still exist and our analysis indicates that the disbenefits to non-HOV lane users would be far greater than the benefit to the HOV lane users. Furthermore, the projected number of HOV lane users is less than for the HOV lane in the state-owned section.



Therefore, we have reached the conclusion that an HOV lane should not be recommended.

ORIGINAL SIGNED  
MELVIN R. LEHR  
Melvin R. Lehr  
Director of Transportation  
Planning and Research

Enclosure

cc: Mr. Donald Linky w/attachment  
 Comr. Louis J. Gambaccini w/o attachment  
 Dep. Comr. John Jamieson w/o att.  
 Ms. Amy Rosen w/o att.  
 Mr. Eugene Reilly w/o att.  
 ✓ Mr. Richard Hollinger w/o att.  
 Mr. Tim Carden, w/att.

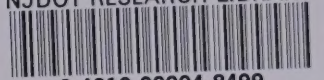
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